

ON THE 'ARNETH COUNT' IN HOOK- WORM-INFECTED WHITE CHILDREN IN NORTH QUEENSLAND

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In the past, work has been carried out by Breinl and Priestly (1914) on Arneth counts of healthy white school children, who had spent their lives in the tropical parts of North Queensland. The observations proved a decided shift of the Arneth index to the left, when compared with that of normal individuals in Europe. Later, this investigation was extended to healthy aboriginal children in Northern Australia (1917), and, furthermore, to native children in New Guinea (1915), living in an area where malaria, yaws and other parasitic diseases were found to be endemic.

A shift of the Arneth index to the left was found in healthy aboriginal children of North Queensland analogous to that of children of European descent in North Queensland, but a much more pronounced shift was found in the native children of New Guinea.

Taking advantage of recent opportunities, blood smears obtained from white children in North Queensland, suffering from ancylostomiasis were examined in order to determine the Arneth index. A number of the smears were collected by one of the members of the staff of the hookworm campaign, carrying out work at present in North Queensland; others were obtained from children of various ages, who underwent treatment for hookworm infection in the Townsville Hospital.

Previous observations by Knapp (1915) in India showed in the blood of hookworm patients a distinct shift of the Arneth index to

the right, but the results, according to his own statement, 'were on the whole equivocal,' and he proposed to carry out further research.

Macfie (1916), working on the Gold Coast, confirmed to a certain extent Knapp's tentative results. Out of seventeen counts made on hookworm patients, about 30 per cent. showed, when compared with those of healthy natives, an actual shift to the right, 41 per cent. had a relative shift to the right, that is, 'a slighter degree of shift to the left than is found in apparently healthy natives,' and 29 per cent. had a definite shift to the left. He concluded from his results that 'there appeared unquestionably a tendency to develop a shift to the right in patients infected with hookworms.'

In the present investigation the same technique was employed as in the previous work; all counts were performed by myself, Dr. Priestly and myself having performed the previous counts. In this way the results, so far as technique is concerned, are comparable with those obtained previously, and the personal source of error has been, so far as possible, excluded.

Two hundred consecutive leucocytes were counted in two sets of 100, and only when the two sets of figures differed but slightly were the counts taken into consideration.

All the children from whom the blood was obtained lived in areas where malaria is practically unknown, and any definite change found must be attributed to the effects of hookworm infection.

The figures (Table I) were separated according to age groups, and the table shows that the averages for the age groups between five and fifteen years are fairly constant. The Arneth index for children two and three years old is much lower, and approaches that found in healthy North Queensland children. The disproportionate rise for children four years of age may be due to the small number of observations. The total averages prove conclusively that the average Arneth index in hookworm-infected children shows a decided shift to the left.

A comparison of the Arneth index of hookworm-infected white children in North Queensland with that of children living in New Guinea shows a striking similarity, and strengthens the assumption that the comparative increase in the Arneth index in the latter locality was due to the great incidence of latent and active infection

Age	Number of children	ARNETH CLASSIFICATION %						DIFFERENTIAL COUNTS %					
		I	II	III	IV	V	Arneth Index	Poly- morpho- nuclear neutro- phile	Transi- tionals	Large Mono- nuclear	Lympho- cytes	Eosino- philes	Mast cells
years													
2	3	30.0	42.5	24.0	3.0	0.5	72.5	38.9	2.7	0.8	44.0	12.41	0.2
3	4	31.0	44.4	18.9	5.2	0.5	75.4	36.1	3.5	0.8	41.1	17.9	0.6
4	2	61.0	34.5	4.3	0.2	—	95.5	41.6	5.5	0.7	29.6	22.1	0.5
5	5	41.3	40.5	15.7	2.4	0.1	81.8	46.98	3.04	0.70	32.78	15.74	0.76
6	12	42.42	40.66	13.87	2.95	0.1	83.08	49.10	2.54	0.52	34.28	12.75	0.81
7	17	42.91	39.95	14.56	3.53	0.05	82.86	54.33	3.01	0.61	30.99	10.72	0.34
8	11	43.81	41.51	12.46	2.18	0.04	85.32	46.31	3.01	0.39	35.74	14.15	0.40
9	14	41.65	41.72	13.90	2.53	0.20	83.37	56.59	2.94	0.88	28.77	10.32	0.50
10	11	45.00	40.09	13.23	1.54	0.14	85.09	58.13	2.61	0.45	27.04	11.34	0.43
11	9	41.12	42.39	13.83	2.66	—	83.51	53.89	2.71	0.32	25.79	16.65	0.64
12	12	42.75	40.50	14.42	2.29	0.04	83.25	57.79	2.74	0.55	29.22	9.22	0.48
13	8	39.94	43.06	14.56	2.31	0.13	83.00	53.62	3.17	0.46	31.74	10.28	0.73
14	9	39.77	40.61	15.89	3.34	0.39	80.38	49.39	3.87	0.61	35.10	10.23	0.80
15	4	45.50	41.50	11.25	1.75	—	87.00	48.62	3.03	0.50	34.43	12.92	0.50
2 to 15	121	42.11	41.05	14.20	2.51	0.13	83.16	51.88	3.00	0.58	31.75	12.22	0.57
Native children of New Guinea, aged 1-10 years	50	42.96	40.90	13.80	2.13	0.21	83.86	40.96	2.47	1.36	42.86	13.24	—
North Queensland school children (white) 7-15 years	150	32.50	42.0	20.6	4.5	0.4	74.5	56.1	4.2	2.4	29.5	7.7	0.04

amongst children, amongst whom hookworm infection is probably widespread.

The significance of the shift of the Arneth index to the left is still uncertain. It is, however, possible that in such diseases as hookworm infection and malaria, where the destruction of red cells goes, for a time at least, hand in hand with an increased activity of the blood-forming organs, the increased activity extends to the new formation of leucocytes, and in consequence a greater number of young leucocytes are met with in the peripheral blood.

The differential counts indicate that in younger children—between two and four years of age—the relative number of polymorphonuclear neutrophile leucocytes is decreased, whereas that of the lymphocytes is increased.

After the seventh year the relative proportion of the various forms of white blood corpuscles is fairly constant.

As is to be expected, the relative increase in the number of eosinophile leucocytes is well pronounced throughout our series of counts.

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